(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 887 664 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
08.07.2009 Bulletin 2009/28

(51) Int Cl.:
H01R 13/629 *(2006.01)*

(21) Application number: **07015499.2**

(22) Date of filing: **07.08.2007**

(54) **Lever connector**

Hebelverbinder

Connecteur à levier

(84) Designated Contracting States:
DE GB

(30) Priority: **07.08.2006 JP 2006214011**

(43) Date of publication of application:
13.02.2008 Bulletin 2008/07

(73) Proprietor: **Japan Aviation Electronics Industry, Limited**
Shibuya-ku
Tokyo (JP)

(72) Inventors:
- **Okuda, Katsumasa**
  Tokyo (JP)
- **Majima, Satoru**
  Tokyo (JP)
- **Aizawa, Hidenori**
  Tokyo (JP)

(74) Representative: **Hofer, Dorothea et al**
Prüfer & Partner GbR
Patentanwälte
Sohnckestrasse 12
81479 München (DE)

(56) References cited:
EP-A- 1 672 747
DE-U1- 8 700 210
US-B2- 6 733 313

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 887 664 B1

Printed by Jouve, 75001 PARIS (FR)

Description

BACKGROUND OF THE INVENTION:

[0001] This invention relates to a lever connector having a lever, rotation of which effects connection/disconnection of the lever connector with a mating connector.

[0002] A lever connector is disclosed in USP 6,733,313B. The disclosed lever connector comprises a housing and a lever. The housing supports the lever so that the lever is rotatable between a disconnection position and a connection position in a predetermined plane. The lever is provided with a locking portion that is bendable in a direction perpendicular to the predetermined plane. Upon rotation of the lever from the disconnection position to the connection position, the locking portion is engaged with another locking portion provided to the mating connector. The lever connector is thus locked at the connection position.

[0003] US 6,733,313 B2 discloses a connector assembly wherein lever of is in the form of a single plate, and a resilient lock for locking the lever at a connection completing position and a finger placing portion used to rotate the lever are adjacent to each other at one end of the lever. The resilient lock extends along the plane of the lever and is resiliently deformable along a direction normal to the plane. Thus, a larger area can be secured for an unlocking portion of the resilient lock without increasing the thickness of the lever, thereby providing good unlocking operational efficiency.

SUMMARY OF THE INVENTION:

[0004] There is a need for a lever connector with a low profile, especially, for a thinner lever. The object is achieved by a lever connector according to claim 1. Further developments of the invention are indicated in the dependent claims.

[0005] An appreciation of the objectives of the present invention and a more complete understanding of its structure may be had by studying the following description of the preferred embodiment and by referring to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS:

[0006]

Fig. 1 is a view schematically showing a connector assembly comprised of a lever connector and a mating connector in accordance with a first embodiment of the present invention, the lever connector and the mating connector being in a connection state;
Fig. 2 is a view schematically showing the lever connector of Fig. 1, a lever of the lever connector being in a connection position;
Fig. 3 is a schematic view showing the lever connector of Fig. 1, the lever being in a disconnection position;
Fig. 4 is a front view schematically showing a part of the lever connector of Fig. 2, the lever being in the connection position;
Fig. 5 is a cross-sectional view schematically showing the lever connector taken along lines A-A of Fig. 4, the lever being in the connection position;
Fig. 6 is a cross-sectional view schematically showing the lever connector taken along lines A-A of Fig. 4, the lever being in the disconnection position;
Fig. 7 is a view schematically showing the lever included in the lever connector of Fig. 2;
Fig. 8 is a front view schematically showing a part of the mating connector of Fig. 1;
Fig. 9 is a cross-sectional view schematically showing a mating cam portion included in the mating connector, taken along lines B-B of Fig. 8;
Fig. 10 is a cross-sectional view schematically showing the lever connector of Fig. 6 and the mating cam portion of Fig. 9 in a disconnection state;
Fig. 11 is a cross-sectional view schematically showing the lever connector and the mating cam portion of Fig. 10 in an in-progress state;
Fig. 12 is a cross-sectional view schematically showing of the lever connector of Fig. 5 and the mating cam portion of Fig. 9 in a connection state;
Fig. 13 is a view schematically showing a lever connector according to a second embodiment of the present invention;
Fig. 14 is a front view schematically showing a part of the lever connector of Fig. 13;
Fig. 15 is a top plan view schematically showing a lever included in the lever connector of Fig. 13; and
Fig. 16 is a cross-sectional view schematically showing the lever connector taken along lines C-C of Fig. 14.

[0007] While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof are shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that the drawings and detailed description thereto are not intended to limit the invention to the particular form disclosed, but on the contrary, the intention is to cover all modifications, equivalents and alternatives falling within the spirit and scope of the present invention as defined by the appended claims.

DESCRIPTION OF PREFERRED EMBODIMENTS:

[0008] Referring to Fig. 1, a connector assembly 1 according to a first embodiment of the present invention comprises a lever connector 2 and a mating connector 3. The lever connector 2 and the mating connector 3 are connected with each other in a direction 90.

[0009] Referring to Figs. 2 and. 3, the lever connector 2 of the first embodiment comprises a housing 10, a lever 11, a plurality of wirings 12, and a plurality of connector

terminals (not shown). The housing 10 is made of resin and formed with a terminal accommodation portion 20 and a lever accommodation portion 21.

[0010] The terminal accommodation portion 20 comprises a front surface 22, a back surface 23, and a plurality of wiring accommodation holes 24. The front surface 22 is perpendicular to the direction 90 and, when the lever connector 2 is mated with the mating connector 3, is inserted into the mating connector 3. The back surface 23 is also perpendicular to the direction 90. Each of the terminal accommodation holes 24 extends from the front surface 22 to the back surface 23.

[0011] The wirings 12 are inserted into the respective terminal accommodation holes 24 and are connected with the respective connector terminals within the respective terminal accommodation holes 24.

[0012] Referring to Figs. 2 to 6, the lever accommodation portion 21 comprises a surface 30, an upper plate 31, a spindle 32, an engagement portion 33, a protrusion 34, a stopper 35, a lock portion 36, and a guide portion 40.

[0013] The illustrated surface 30 is a planar surface perpendicular to the front and the back surfaces 22, 23. The upper plate 31 is positioned above the surface 30 and is substantially in parallel with the surface 30. The surface 30 and the upper plate 31 define a space therebetween, within which the lever 11 is accommodated.

[0014] The spindle 32 has a cylindrical shape. The spindle 32 extends from the surface 30 toward the upper plate 31. The spindle 32 has an axial direction which is perpendicular to the surface 30, and a radial direction perpendicular to the axial direction.

[0015] The engagement portion 33 is formed on the surface 30. The engagement portion 33 extends toward the upper plate 31 in the axial direction. In the first embodiment, the engagement portion 33 has a contact plane 37 perpendicular to the surface 30.

[0016] The protrusion 34 is formed on the surface 30 and is positioned near to the back surface 23 and one of side surfaces of the housing 2.

[0017] The stopper 35 has a bar-like shape and is bendably supported by the housing 10. The stopper 35 is positioned between the surface 30 and the upper plate 31 and extends from the back surface 23 towards the front surface 22. The stopper 35 has a base end 41 and a free end 42. The base end 41 is positioned close to the back surface 23. The free end 42 is positioned inside the lever accommodation portion 21. The stopper 35 is bendable in a plane parallel to the surface 30. The free end 42 is provided with a protrusion portion 43 and an engagement portion 44. The protrusion portion 43 protrudes toward the spindle 32. The engagement portion 44 is formed beneath the protrusion portion 43 and faces to the surface 30.

[0018] The lock portion 36 is formed on the surface 30 and is positioned close to the front surface 22.

[0019] The guide portion 40 is an opening portion formed in the upper plate 31 and is positioned close to the front surface 22.

[0020] Referring to Fig. 7 together with Figs. 2 to 6, description will be made about the lever 11. The lever 11 of the first embodiment is integrally formed of a single material.

[0021] The lever 11 of the first embodiment comprises a main plate portion 50, a lever cam portion 51, a supporter portion 50a, a guard portion 52, an arm 53, an engagement portion 54, a surface 55, a hole 56, and a lock portion 57.

[0022] The main plate portion 50 has a plate-like shape. The hole 56 is formed in the main plate portion 50 to penetrate the main plate portion 50 in the axial direction. The hole 56 has increased diameters with its depth. The diameter of the hole 56 near the surface 30 is larger than the diameter near the upper plate 31. The spindle 32 is inserted into the hole 56 from an under side of the main plate portion 50 so that the main plate portion 50 is rotatably supported in the lever accommodation portion 21.

[0023] The above-described structure of the first embodiment provides the lever 11 with the rotary movement between a first position (connection position) and a second position (disconnection position). Fig. 5 shows the lever 11 in the first position. In the first position, the lever connector 2 and the mating connector 3 are connected. Fig. 6 shows the lever 11 in the second position. In the second position, the lever connector 2 and the mating connector 3 are disconnected.

[0024] The lever cam portion 51 of this embodiment is a pinion tooth extending from the main plate portion 50 along a direction perpendicular to the axial direction. In other words, the pinion tooth projects from the main plate portion 50 along the radial direction of the spindle 32.

[0025] The supporter portion 50a extends from the main plate portion 50, especially, from a corner of the main plate portion 50 to its end portion 60.

[0026] The guard portion 52 is formed of a long portion and a short portion so as to form an L-shape, as seen from the above. The guard portion 52 extends from the supporter portion 50a and from the main plate portion 50. The long portion of the guard portion 52 extends from the end portion 60 of the supporter portion 50a. Namely, one end of the long portion is connected to the end portion 60 of the supporter portion 50a. The short portion of the guard portion 52 extends between another corner 61 of the main plate portion 50 and the other end of the long portion of the guard portion 52.

[0027] The guard portion 52 is formed with a handle portion 62. The handle portion 62 is a nonskid handle provided with some recesses which help the lever 11 to be easily operated. The handle portion 62 is positioned at a corner of the guard portion 52, i.e. a contact point of its long portion and its short portion.

[0028] The short portion of the guard portion 52 is comprised of two sub-portions, each of which is connected between the main plate portion 50 and the handle portion 62 and is separated from the other in the axial direction so that the sub-portions and the long portion as well as

the main plate portion 50 define a space 63.

[0029] The supporter portion 50a has a guide portion 64 at a point of connection between the main plate portion 50 and the supporter portion 50a. A part of the supporter portion 50a has a thickness in the axial direction thinner than the main plate portion 50 thereby to form the guide portion 64.

[0030] The arm 53 has a bar-like shape and extends from the supporter portion 50a through the space 63 of the short portion of the guard portion 52 beyond the short portion. The arm 53 has a main portion 70, an engagement portion 71, a base end 72 and a free end 73. The base end 72 is integrally formed with the supporter portion 50a. The free end 73 has a rounded shape and projects through the space 63 beyond the short portion of the guard portion 52. The arm 53 is bendable in a predetermined direction perpendicular to the axial direction. The base end 72 has a width in the predetermined direction and a thickness in the axial direction. The width of the base end 72 is smaller than the thickness so that the arm 53 is easy to be bent in the predetermined direction. In this embodiment, the free end 73 has another width which is larger than the width of the base end 72.

[0031] The engagement portion 71 is integrally formed with the main portion 70 and is positioned between the base end 72 and the free end 73. The engagement portion 71 protrudes from the main portion 70 in the predetermined direction toward the hole 56. The engagement portion 71 has a pressed portion 74 and a contact portion 75. The pressed portion 74 gently slopes toward the free end 73. The contact portion 75 is positioned at the end of the slope of the pressed portion 74. The contact portion 75 has a surface perpendicular to the main plate portion 50 and is designed to receive the contact portion 37 of the engagement portion when the lever is perpendicular at the connection position.

[0032] The engagement portion 54 extends from the main plate portion 50. The engagement portion 54 has a thickness thinner than the main plate portion 50. The engagement portion 54 is designed so that the engagement portion 54 is engaged with the engagement portion 44 when the lever 11 is positioned at the disconnection position.

[0033] The surface 55 is perpendicular to the main plate portion 50 and is positioned between the lever cam portion 51 and the engagement portion 54. In other words, the lever cam portion 51, the engagement portion 54 and the surface 55 form a pocket, as seen along the axial direction.

[0034] The lock portion 57 extends from the main plate portion 50. The lock portion 57 is designed so that the lock portion 57 is brought into contact with the lock portion 36 when the lock portion 57 is positioned at the disconnection position. The contact of the lock portions 57 and 36 prevent the lock portion 57 from the counter clockwise rotation thereof beyond the lock portion 36.

[0035] The lever 11 is accommodated in the lever accommodation portion 21 such that the main plate portion 50 is parallel to the surface 30. When the lever 11 is in the connection position, both of the handle portion 62 and the free end 73 of the arm 53 are positioned close to the back surface 23, as best shown in Fig. 5. When the lever 11 is in the disconnection position, the handle portion 62 protrudes from the back surface 23, as best shown in Fig. 6.

[0036] Referring now to Fig. 1, the mating connector 3 includes a housing 80 and a plurality of connector terminals 81. The housing 80 is formed so as to cover a part of the housing 10 upon connection of the lever connector 2 and the mating connector 3. The connector terminals 81 are held by the housing 80. Upon the connection of the lever connector 2 and the mating connector 3, the connector terminals 81 are guided into the respective wiring accommodation holes 24 of the terminal accommodation portion 20 and are connected with the respective connector terminals in the housing 10. Outside the housing 80, each of the connector terminals 81 is connected to other elements such as a substrate.

[0037] Referring to Fig. 8, the housing 80 is provided with a mating cam portion 82 extending inside the housing 80. As shown in Fig. 9, the mating cam portion 82 is provided with an engagement portion 83. The engagement portion 83 of this embodiment is a shape which is recessed in a direction perpendicular to the direction 90. The shape of the engagement portion 83 corresponds to the engagement portion 51 of the lever 11.

[0038] Description will be made about processes of the connection of the lever connector 2 and the mating connector 3, with reference to Figs. 6 and 10 to 12. Herein, Figs. 10 to 12 simply show the mating cam portion 82 of the mating connector 3. Other members of the mating connector 3 are omitted from the drawing for the purpose of simplifying the description.

[0039] Referring to Fig. 6, the lever 11 is in the disconnection position. The engagement portion 54 is engaged with the engagement portion 44. The lock portion 57 is brought into contact with the lock portion 36. Under this state, the handle portion 62 protrudes from the lever accommodation portion 21, and the engagement portion 33 is positioned at an entrance of the guide portion 64. In addition, the pocket constituted by the lever cam portion 51, the engagement portion 54 and the surface 55 opens in the direction 90 so that, as shown in Fig. 10, the pocket can receive the mating cam portion 82 when the lever connector 2 is mated with the mating connector 3. When the mating cam portion 82 is inserted through the guide portion 40 and the above-mentioned pocket receives the mating cam portion 82, the mating cam portion 82 is brought into contact with the protrusion portion 43 and presses the protrusion portion 43 so that the stopper 35 is bent away from the mating cam portion 82. Thus, the engagement portion 44 moves apart from the engagement portion 54 and is disengaged from the engagement portion 54. This enables the lever 11 to be rotated toward the connection position.

[0040] Referring to Fig. 11, the lever 11 is rotated in

an anti-clockwise direction toward the connection position by pushing the handle portion 62 into the lever accommodation portion 21. Upon the rotation of the lever 11, the lever cam portion 51 moves in the engagement portion 83 of the mating cam portion 82 so that the mating cam portion 82 is pulled into the lever connector 2 by the engagement portion 51. The engagement portion 33 passes through the guide portion 64 and is brought into contact with the pressed portion 74. The engagement portion 33 slides on the pressed portion 74, while pressing the pressed portion 74 outwardly in the radial direction so that the arm 53 is bent in the predetermined direction. As understood from the movement, the engagement portion 33 has a shape that forces the arm 53 to be bent in the predetermined direction.

[0041] When the lever 11 is further rotated toward the connection position, the lever cam portion 51 is engaged with the engagement portion 83. The mating cam portion 82 gets over the protrusion portion 43 so that the stopper 35 returns to its initial state. Likewise, the engagement portion 33 gets over the pressed portion 74, and the arm 53 returns to its initial state. Thus, as shown in Fig. 12, the contact plane 37 of the engagement portion 33 is received by the contact portion 75 so that the lever 11 is locked at the connection position and is prevented from clockwise rotation away from the connection position towards the disconnection position. In this embodiment, the guard portion 52 also gets over the protrusion 34 upon the rotation of the lever 11 from the disconnection position to the connection position so that the lever 11 is further prevented from the clockwise rotation. Under this state, the lever connector 2 is completely connected with the mating connector 3.

[0042] In order to disconnect the lever connector 2 from the mating connector 3, the free end 73 of the arm 53 together with the handle portion 62 is pinched so that the arm 53 is bent toward the handle portion 62 in the predetermined direction. Thus, the lock of the lever 11 is released. Under this state, the handle portion 62 is moved so that the lever 11 is rotated in a clockwise direction. During the lever 11 is rotated from the connection position to the disconnection position, the mating cam portion 82 and the lever cam portion 51 perform operations reverse to the above-mentioned operations upon the connection so that the mating connector 3 is pushed out from the lever connector 2.

[0043] The connector assembly 1 may be modified. For example, the lever 11 may comprise a plurality of pinion teeth as the engagement portion. The mating connector 3 may have a cam pin which is engaged with a recess provided to the lever 11 for pulling the mating connector toward the lever connector 2.

[0044] Referring to Fig. 13, a connector assembly according to a second embodiment comprises a lever connector 102 and a mating connector (not shown). The lever coonector 102 includes a lever 111 and a lever accommodation portion 121. The lever connector 102, the lever 111, and the lever accommodation portion 121 have the structure different from the first embodiment. The other members are similar to the first embodiment and the description therefor will be omitted.

[0045] Referring to Fig. 14, the lever 111 is in the connection position. An engagement portion 133 is formed on a lower surface of an upper plate 131 and is extending toward inside the lever accommodation portion 121. The engagement portion 133 has a contact plane 137.

[0046] Referring to Fig. 15, the lever 111 has a main plate portion 150, a lever cam portion 151, a supporter portion 150a, a guard portion 152 and an arm 153, an engagement portion 154, a surface 155 and a hole 156. The lever cam portion 151, the engagement portion 154, the surface 155 and the hole 156 function similar to the lever cam portion 51, the engagement portion 54, the surface 55 and the hole 56, respectively, of the first embodiment. The supporter portion 150a extends from the main plate portion 150 and is formed with a guide portion 164, which is positioned close to the main plate portion 150.

[0047] The guard portion 152 has a long portion and a short portion which constitute an L-like shape. The long portion of the guard portion 152 extends from an end of the supporter portion 150a. The short portion of the guard portion 152 extends between the long portion of the guard portion 152 and the main plate portion 150. On the corner of the L-like shaped guard portion 152, a handle portion 162 is formed.

[0048] Referring to Figs. 15 and 16, the arm 153 has a bar-like shape and extends from the supporter portion 150a. The arm 153 has a main portion 170, an engagement portion 171, a base end 172 and a free end 173. The base end 172 is integrally formed with the supporter portion 150a. The free end 173 protrudes beyond the guard portion 152. The arm 153 is bendable in a direction 190 which is inclined with respect to the axial direction as illustrated in Fig. 14.

[0049] The arm 153 has a longitudinal direction extending from the base end 172 to the free end 173. The arm 153 also has a width in the direction 190 and a thickness perpendicular to the direction 190. The width of the arm 153 is smaller than the thickness so that the arm 153 is easily bent in the direction 190.

[0050] Referring to Fig. 16, the engagement portion 171 in integrally formed with the main portion 170. The engagement portion 171 protrudes from the main plate portion 150 in the direction 190 toward the hole 156 and the upper plate 131. The engagement portion 171 has a pressed portion 174 and a contact portion 175. The pressed portion 174 gently slopes toward the free end 173. The contact portion 175 is positioned at the end of the slope of the pressed portion 174. The contact portion 175 has a surface perpendicular to the main plate portion 150.

[0051] Upon rotation of the lever 111 from the disconnection position to the connection position, the engagement portion 133 presses the pressed portion 174 in the direction 190 so that the arm 53 is bent in the direction

190. When the engagement portion 133 gets over the pressed portion 174, the arm 153 returns back to its initial state so that the contact plane 137 of the engagement portion 133 is received by the contact portion 71. Thus, the lever 111 is locked at the connection position. With this structure, the locking state can be released by bending the arm in the direction 190, followed by operating the handle portion 162.

[0052] The present application is based on Japanese patent applications of JP2006-214011 filed before the Japan Patent Office on August 7, 2006, the contents of which are incorporated herein by reference.

Claims

1. A lever connector (2) connectable with a mating connector (3), comprising:

a lever (11) comprising a main plate portion (50), a supporter portion (50a) and an arm (53), the main plate portion being laid in parallel with a predetermined plane, the supporter portion extending from the main plate portion, the arm being supported by the supporter portion and being bendable in a predetermined direction, the predetermined direction being in parallel with the predetermined plane, the arm being provided with a first engagement portion (54); and
a housing (10) comprising an accommodation portion (21) and a second engagement portion (33), the second engagement portion being formed in the accommodation portion, the housing accommodating and rotatably supporting the main plate portion in the accommodation portion so that the lever is provided with rotary movement between a first position and a second position, the lever connector being connected to the mating connector and the first engagement portion being engaged with the second engagement portion upon rotation of the lever from the first position to the second position, the lever connector being disconnected from the mating connector upon rotation of the lever from the second position to the first position after the disengagement of the first engagement portion from the second engagement portion by bending the arm in the predetermined direction.

2. The lever connector (2) as claimed in claim 1, the mating connector (3) comprising a mating cam portion (82), wherein the main plate portion (50) of the lever (11) is provided with a lever cam portion (51), the lever cam portion in cooperation with the mating cam portion forcing the lever connector to be connected to the mating connector upon rotation of the lever from the first position to the second position, the lever cam portion in cooperation with the mating cam portion forcing the lever connector to be disconnected from the mating connector upon rotation of the lever from the second position to the first position.

3. The lever connector (2) as claimed in one of claims 1 to 2, wherein the first engagement portion (54) has a first contact plane parallel to the predetermined direction, the second engagement portion (33) having a second contact plane, the second contact plane being formed so that the second contact plane is brought into contact with the first contact plane to lock the lever (11) at the second position upon engagement of the first engagement portion.

4. The lever connector (2) as claimed in one of claims 1 to 3, wherein each of the first and the second contact planes is perpendicular to the predetermined plane.

5. The lever connector (2) as claimed in one of claims 1 to 4, wherein the arm (53) has a base end (72) and a free end (73), the base end being continuing to the supporter portion (50a), the base end having a width in the predetermined direction and a thickness in a direction perpendicular to the predetermined direction, the width being smaller than the thickness.

6. The lever connector (2) as claimed in claim 5, wherein the free end (73) has another width larger than the width of the base end (72).

7. The lever connector (2) as claimed in claim 5 or 6, wherein the lever (11) further comprises a guard portion (52) extending from the main plate portion (50) and the support portion (50a), the guard portion guarding the arm (53) with the free end (73) projecting beyond the guard portion in the direction perpendicular to the predetermined direction.

8. The lever connector (2) as claimed in one of claims 1 to 7, wherein the second engagement portion (33) has a shape that forces the arm (53) to be bent upon rotation of the lever (11) from the first position to the second position so that the arm is bent in the predetermined direction.

9. The lever connector (2) as claimed in one of claims 1 to 8, wherein:

the lever (11) further comprises a third engagement portion (71) protruding from the main plate portion (50a);
the housing (10) further comprises a stopper (35), the stopper extending inside the accommodation portion (21) and being bendable in the predetermined plane, the stopper being provided with a fourth engagement portion (44);
the third engagement portion is engaged with

the fourth engagement portion upon rotation of the lever from the second position to the first position; and
the lever is locked at the first position by the engagement of the third engagement portion and the fourth engagement portion and is prevented from moving to the second position.

10. The lever connector (2) as claimed in claim 9, wherein the stopper (35) has a shape that is designed to disengage the fourth engagement portion (44) from the third engagement portion (71) upon preliminary fitting of the lever connector to the mating connector (3).

11. The lever connector (2) as claimed in claim 9 or 10, wherein:

the lever (11) further comprises a first lock portion (57) protruding from the main plate portion (50);
the housing (10) further comprises a second lock portion (36); and
upon rotation of the lever from the first position to the second position, the first lock portion is brought into contact with the second lock portion so that the lever is locked at the first position and is prevented from rotating beyond the first position.

Patentansprüche

1. Hebelverbinder (2), der mit einem Gegenverbinder (3) verbindbar ist und enthält:

einen Hebel (11), der einen Hauptplattenabschnitt (50), einen Halteabschnitt (50a) und einen Arm (53) enthält, wobei der Hauptplattenabschnitt parallel zu einer vorbestimmten Ebene liegt, der Halteabschnitt sich von dem Halteabschnitt aus erstreckt, der Arm von dem Halteabschnitt gehalten wird und in einer vorbestimmten Richtung biegbar ist, die vorbestimmte Richtung parallel zu der vorbestimmten Ebene ist, der Arm mit einem ersten Eingreifabschnitt (54) versehen ist; und
ein Gehäuse (10) mit einem Aufnahmeabschnitt (21) und einem zweiten Eingreifabschnitt (33), wobei der zweite Eingreifabschnitt in dem Aufnahmeabschnitt gebildet ist, das Gehäuse den Hauptplattenabschnitt in dem Aufnahmeabschnitt aufnimmt und drehbar hält, so dass der Hebel mit einer Drehbewegung zwischen einer ersten Stellung und einer zweiten Stellung versehen ist, beim Drehen des Hebels aus der ersten Stellung in die zweite Stellung der Hebelverbinder mit dem Gegenverbinder verbunden wird und der erste Eingreifabschnitt in Eingriff mit dem zweiten Eingreifabschnitt kommt, der Hebelverbinder beim Drehen des Hebels aus der zweiten Stellung in die erste Stellung nach Lösen des ersten Eingreifabschnitts von dem zweiten Eingreifabschnitt durch Biegen des Arms in die vorbestimmte Richtung von dem Gegenverbinder getrennt wird.

2. Hebelverbinder (2) gemäß Anspruch 1, wobei der Gegenverbinder (3) eine Gegennockenabschnitt (82) enthält, der Hauptplattenabschnitt (50) des Hebels (11) mit einem Hebelnockenabschnitt (51) versehen ist, der Hebelnockenabschnitt in Zusammenwirken mit dem Gegennockenabschnitt den Hebelverbinder drängt, beim Drehen des Hebels aus der ersten Stellung in die zweite Stellung der Hebelverbinder mit dem Gegenverbinder verbunden zu werden, der Hebelnockenabschnitt in Zusammenwirken mit dem Gegennockenabschnitt den Hebelverbinder drängt, beim Drehen des Hebels aus der zweiten Stellung in die erste Stellung von dem Gegenverbinder getrennt zu werden.

3. Hebelverbinder (2) gemäß einem der Ansprüche 1 bis 2, bei dem der erste Eingreifabschnitt (54) eine erste Kontaktebene aufweist, die parallel zu der vorbestimmten Richtung ist, der zweite Eingreifabschnitt (33) eine zweite Kontaktebene aufweist, die zweite Kontaktebene so ausgebildet ist, dass die zweite Kontaktebene beim Eingreifen des ersten Eingreifabschnitts in Kontakt mit der ersten Kontaktebene gebracht wird, um den Hebel (11) in der zweiten Stellung zu verriegeln.

4. Hebelverbinder (2) gemäß einem der Ansprüche 1 bis 3, bei dem die erste und die zweite Kontaktebene senkrecht zu der vorbestimmten Ebene sind.

5. Hebelverbinder (2) gemäß einem der Ansprüche 1 bis 4, bei dem der Arm (53) ein Basisende (72) und ein freies Ende (73) aufweist, das Basisende in den Halteabschnitt (50a) übergeht, das Basisende eine Breite in der vorbestimmten Richtung und eine Dicke in einer Richtung senkrecht zu der vorbestimmten Richtung aufweist, wobei die Breite kleiner als die Dicke ist.

6. Hebelverbinder (2) gemäß Anspruch 5, bei dem das freie Ende (73) eine andere Dicke aufweist, die größer als die Dicke des Basisendes (72) ist.

7. Hebelverbinder (2) gemäß Anspruch 5 oder 6, bei dem der Hebel (11) weiter einen Schutzabschnitt (52) enthält, der sich von dem Hauptplattenabschnitt (50) und dem Halteabschnitt (50a) aus erstreckt, wobei der Schutzabschnitt den Arm (53) schützt, dessen freies Ende (73) in der Richtung senkrecht zu

der vorbestimmten Richtung über den Schutzabschnitt hinausragt.

8. Hebelverbinder (2) gemäß einem der Ansprüche 1 bis 7, bei dem der zweite Eingreifabschnitt (33) eine Form aufweist, die den Arm (53) drängt, beim Drehen des Hebels (11) aus der ersten Stellung in die zweite Stellung gebogen zu werden, so dass der Arm in die vorbestimmte Richtung gebogen wird.

9. Hebelverbinder (2) gemäß einem der Ansprüche 1 bis 8, bei dem:

der Hebel (11) weiter einen dritten Eingreifabschnitt (71) aufweist, der von dem Hauptplattenabschnitt (50a) aus vorspringt;
das Gehäuse (10) weiter einen Anschlag (35) aufweist, wobei der Anschlag sich in dem Aufnahmeabschnitt (21) erstreckt und in der vorbestimmten Ebene biegbar ist, wobei der Anschlag mit einem vierten Eingreifabschnitt (44) versehen ist;
der dritte Eingreifabschnitt beim Drehen des Hebels (11) aus der zweiten Stellung in die erste Stellung mit dem vierten Eingreifabschnitt in Eingriff kommt; und
der Hebel durch das Eingreifen des dritten Eingreifabschnitts und des vierten Eingreifabschnitts in der ersten Stellung verriegelt wird und gehindert wird, sich in die zweite Stellung zu bewegen.

10. Hebelverbinder (2) gemäß Anspruch 9, bei dem der Anschlag (35) eine Form aufweist, die dazu entworfen ist, den vierten Eingreifabschnitt (44) bei einem vorläufigen Zusammenfügen des Hebelverbinders mit dem Gegenverbinder (3) von dem dritten Eingreifabschnitt (71) zu lösen.

11. Hebelverbinder (2) gemäß Anspruch 9 oder 10, bei dem:

der Hebel (11) weiter einen ersten Verriegelungsabschnitt (57) aufweist, der von dem Hauptplattenabschnitt (50a) aus vorspringt;
das Gehäuse (10) weiter einen zweiten Verriegelungsabschnitt (36) aufweist; und
der erste Verriegelungsabschnitt beim Drehen des Hebels aus der ersten Stellung in die zweite Stellung in Kontakt mit dem zweiten Verriegelungsabschnitt gebracht wird, so dass der so Hebel in der ersten Stellung verriegelt wird und gehindert ist, sich über die erste Stellung hinaus zu drehen.

Revendications

1. Connecteur à levier (2) destiné à être relié à un connecteur (3) complémentaire comportant :

- un levier (11) ayant une partie de plaque principale (50), une partie de support (50a) et un bras (53), la partie de plaque principale étant parallèle à un plan prédéterminé, la partie de support s'étendant à partir de la partie de plaque principale, le bras étant soutenu par la partie de support et pouvant se courber dans une direction prédéterminée, cette direction prédéterminée étant parallèle au plan prédéterminé,
le bras comportant une première partie d'engagement (54), et
- un boîtier (10) ayant une partie de réception (21) et une seconde partie d'engagement (33), la seconde partie d'engagement étant formée dans la partie de réception, le boîtier recevant et portant en rotation la partie de plaque principale dans la partie de réception de façon que le levier assure un mouvement de rotation entre une première position et une seconde position, le connecteur à levier étant relié au connecteur complémentaire, et la première partie d'engagement étant engagée dans la seconde partie d'engagement par rotation du levier entre sa première position et sa seconde position,
le connecteur à levier étant dégagé du connecteur complémentaire par rotation du levier de sa seconde position à sa première position après dégagement de la première partie d'engagement par rapport à la seconde partie d'engagement, par pliage du bras dans la direction prédéterminée.

2. Connecteur à levier (2) selon la revendication 1, dans lequel
le connecteur complémentaire (3) comporte une partie de came complémentaire (82), la partie de plaque principale (50) du levier (11) ayant une partie de came de levier (51), la partie de came de levier coopérant avec la partie de came correspondante pour forcer le connecteur à levier à se relier au connecteur complémentaire par rotation du levier entre sa première position et sa seconde position, la partie de came du levier coopérant avec la partie de came complémentaire forçant le connecteur à levier à se dégager du connecteur complémentaire par rotation du levier de sa seconde position à sa première position.

3. Connecteur à levier (2) selon les revendications 1 et 2,
dans lequel
la première partie d'engagement (54) a un premier plan de contact parallèle à la direction prédétermi-

née, la seconde partie d'engagement (33) a un second plan de contact, le second plan de contact étant formé pour être mis en contact avec le premier plan de contact et verrouiller le levier (11) dans une seconde position par l'engagement de la première partie d'engagement.

4. Connecteur à levier (2) selon les revendications 1 à 3,
dans lequel
les premier et second plans de contact sont perpendiculaires au plan prédéterminé.

5. Connecteur à levier (2) selon les revendications 1 à 4,
dans lequel
le bras (53) a une extrémité de base (72) et une extrémité libre (73), l'extrémité de base étant continue à la partie de support (50a), l'extrémité de base ayant une largeur dans la direction prédéterminée et une épaisseur dans la direction perpendiculaire à la direction prédéterminée, la largeur étant inférieure à l'épaisseur.

6. Connecteur à levier (2) selon la revendication 5,
dans lequel
l'extrémité libre (73) a une autre largeur plus grande que celle de l'extrémité de base (72).

7. Connecteur à levier (2) selon la revendication 5 ou 6,
dans lequel
le levier (11) comporte en outre une partie de garde (52) à partir de la partie de plaque de garde (50) et la partie de support (50a), la partie de garde assurant le maintien du bras (53) avec son extrémité libre (73) venant en saillie au-delà de la partie de garde dans la direction perpendiculaire à la direction prédéterminée.

8. Connecteur à levier (2) selon les revendications 1 à 7,
dans lequel
la seconde partie d'engagement (33) a une forme qui oblige le bras (53) à se courber par rotation du levier (11) à partir de la première position vers la seconde position de façon que le bras soit courbé dans la direction prédéterminée.

9. Connecteur à levier (2) selon les revendications 1 à 8,
dans lequel
le levier (11) comporte en outre une troisième partie d'engagement (71) venant en saillie de la partie de plaque principale (50a),
le boîtier (10) a en outre une butée (35), cette butée s'étendant à l'intérieur de la partie de réception (21) et pouvant être courbée dans le plan prédéterminé, la butée ayant une quatrième partie d'engagement (44),
la troisième partie d'engagement coopère avec la quatrième partie d'engagement par rotation du levier de la seconde position à la première position, et
le levier est verrouillé dans la première position par engagement de la troisième partie d'engagement et de la quatrième partie d'engagement et il est bloqué pour se déplacer vers la seconde position.

10. Connecteur à levier (2) selon la revendication 9,
dans lequel
la butée (35) a une forme conçue pour dégager la quatrième partie d'engagement (44) par rapport à la troisième partie d'engagement (71) lors de l'ajustement préliminaire du connecteur à levier au connecteur complémentaire (3).

11. Connecteur à levier (2) selon la revendication 9 ou 10,
dans lequel

- le levier (11) comporte en outre une première partie de verrouillage (57) venant en saillie de la partie de plaque principale (50),
- le boîtier (10) comporte en outre une seconde partie de verrouillage (36), et
- lors de la rotation du levier de sa première position à sa seconde position, la première partie de verrouillage est mise en contact avec la seconde partie de verrouillage pour que le levier soit verrouillé dans la première position et ne puisse tourner au-delà de la première position.

FIG. 1

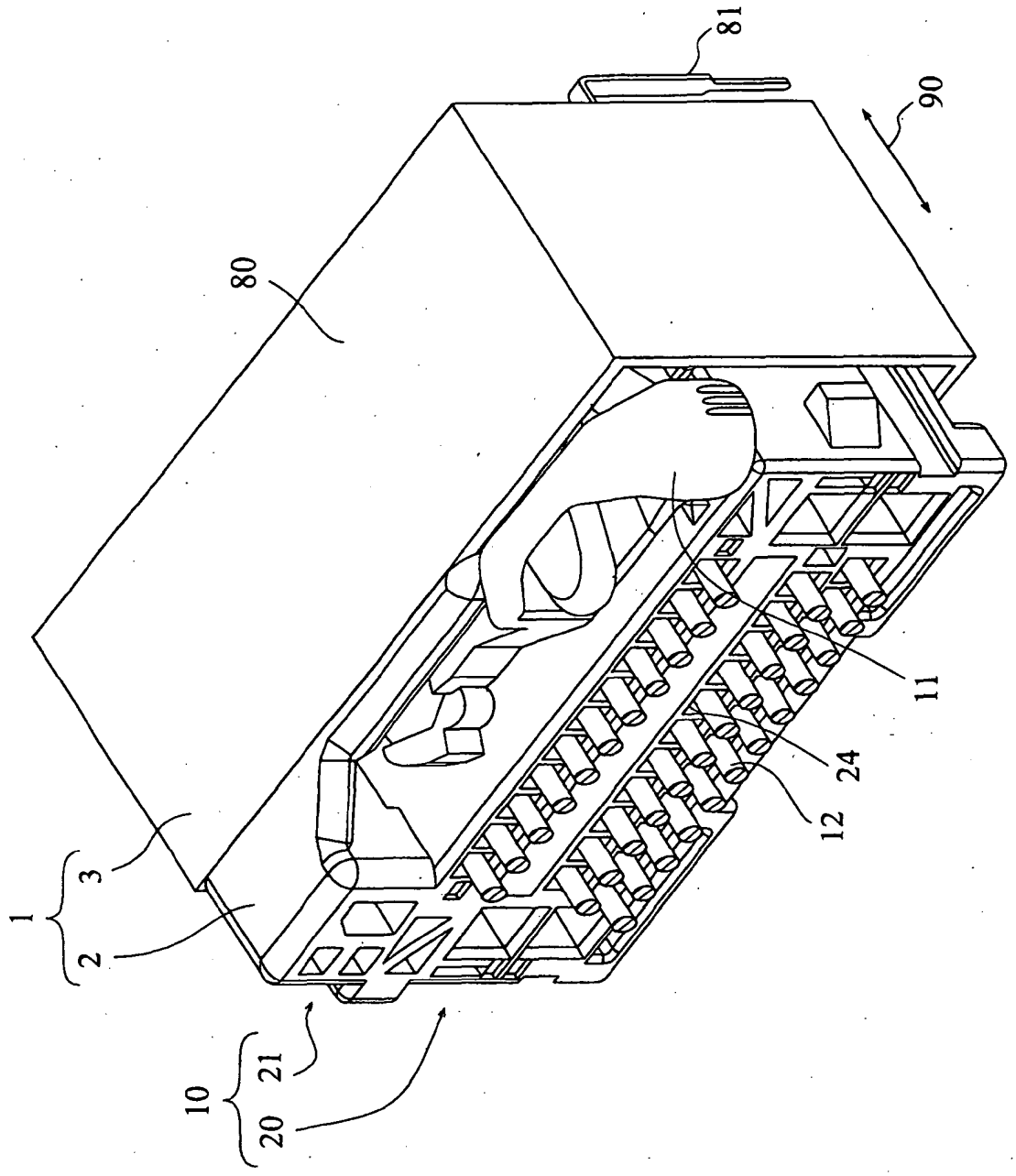


FIG. 2

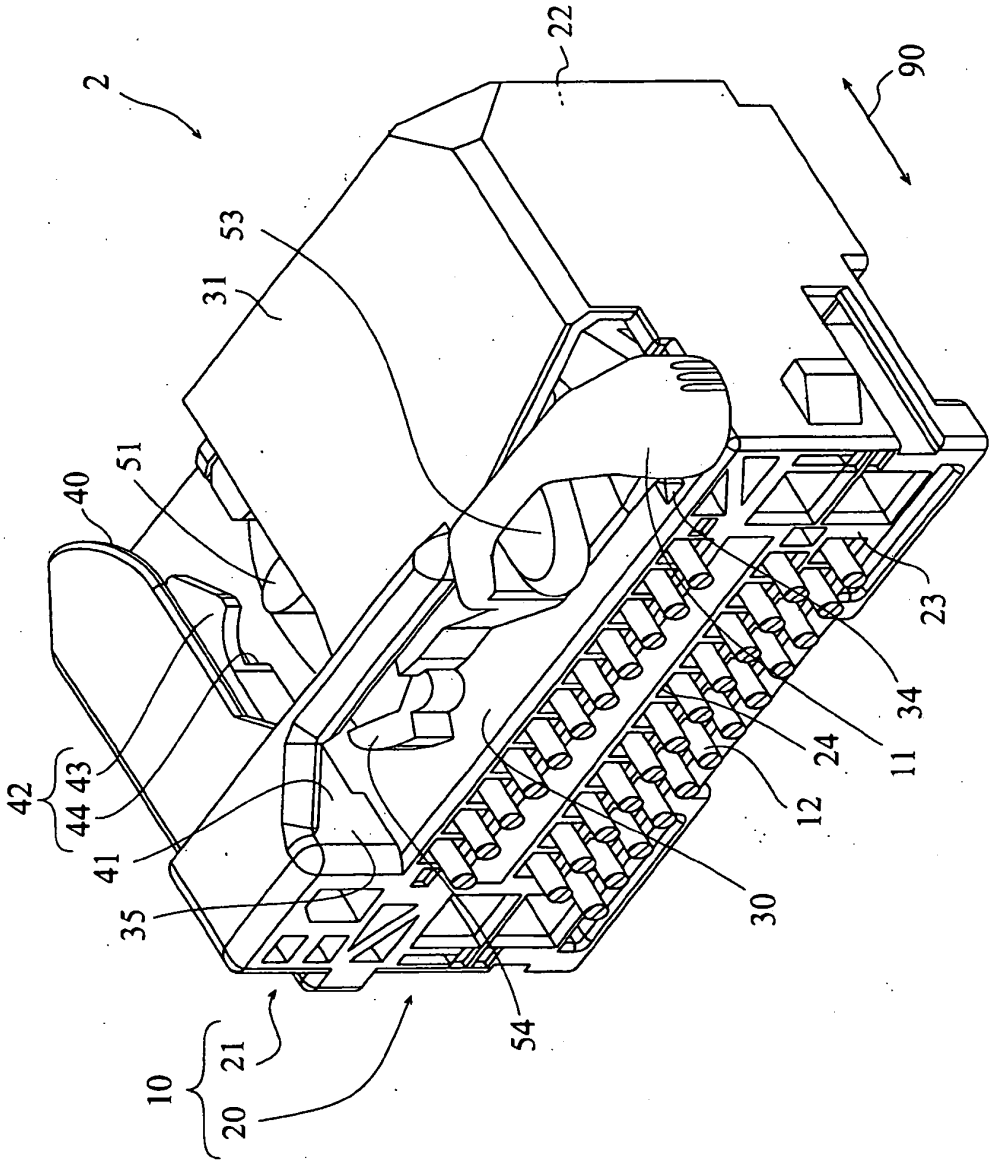


FIG. 3

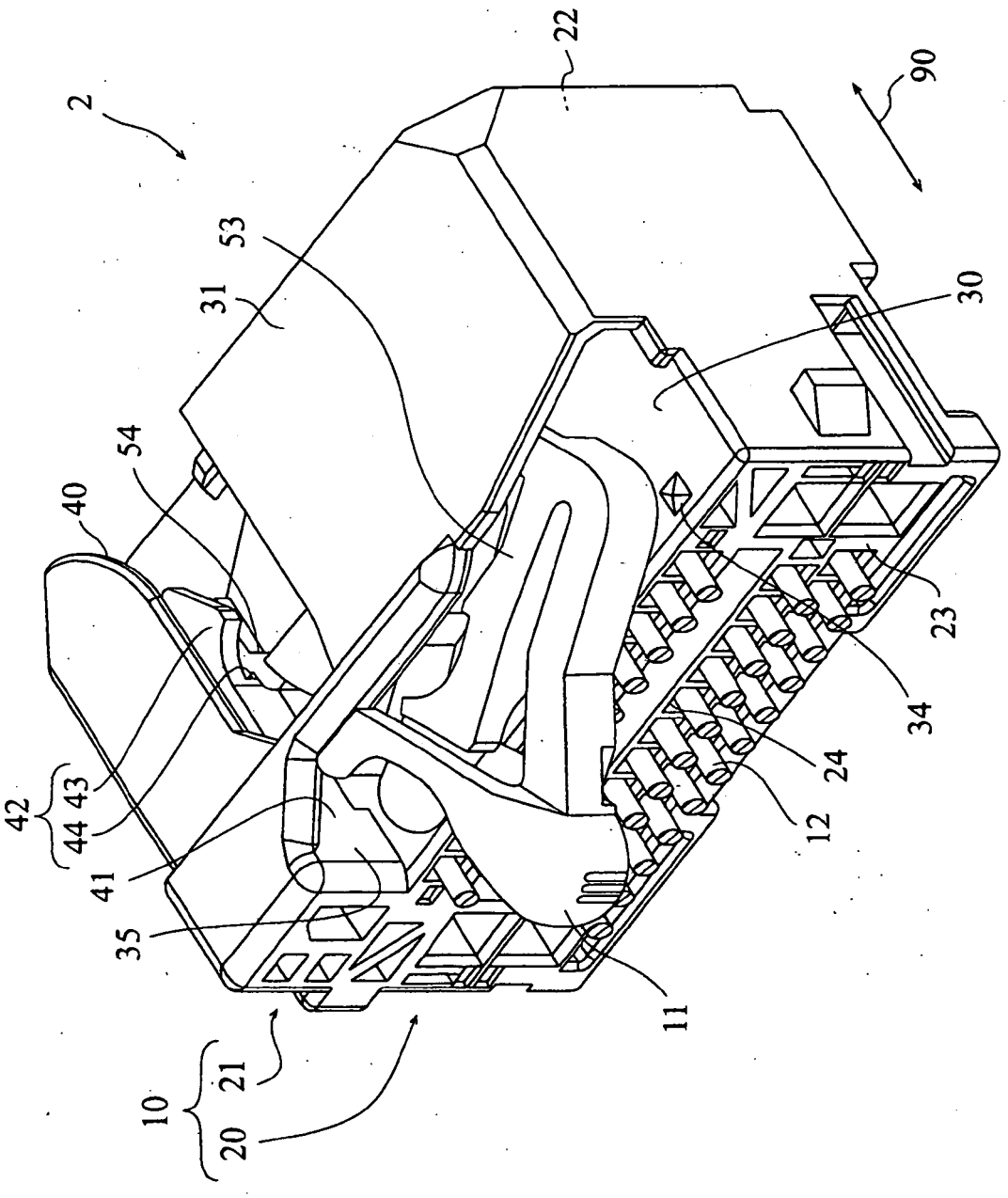


FIG. 4

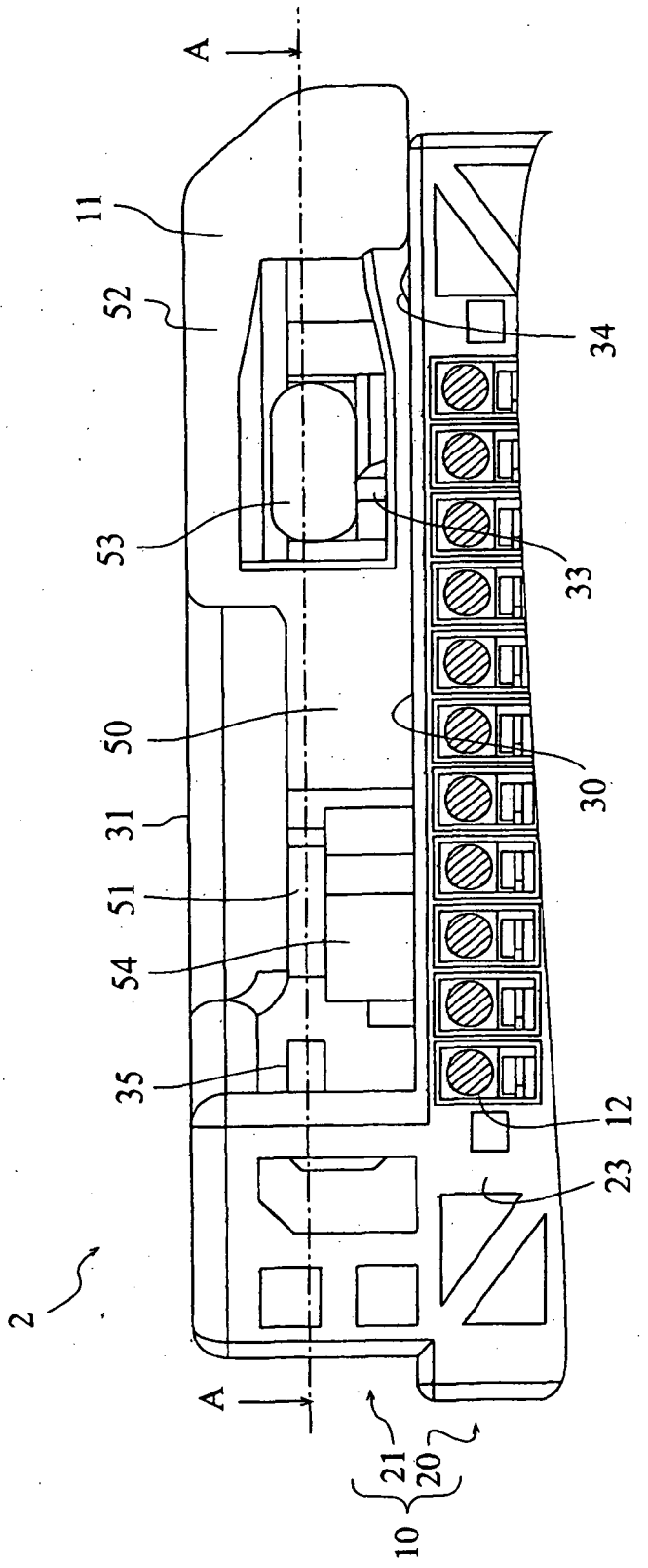


FIG. 5

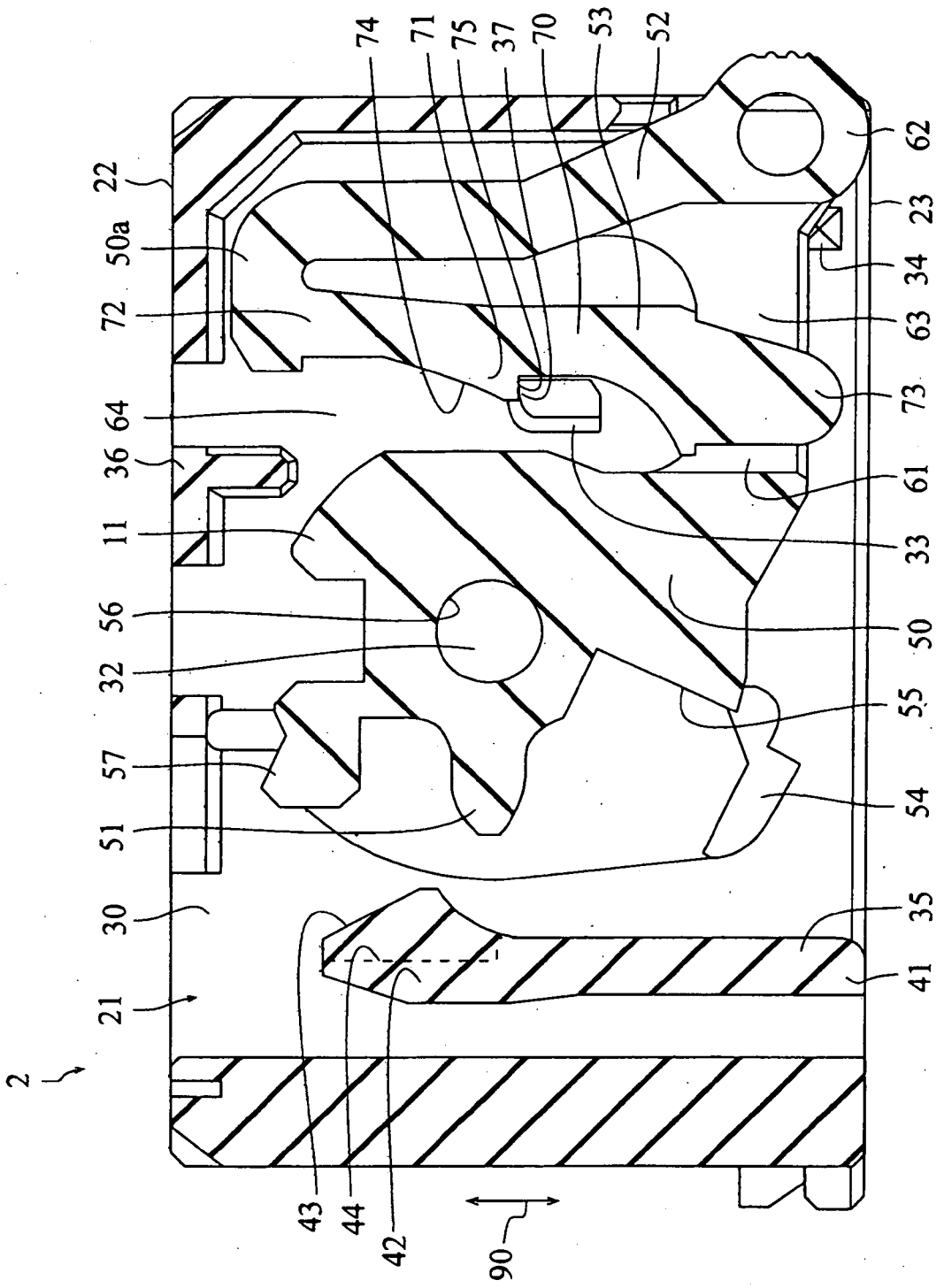

74
71
75
37
70
53
52
22
50a
72
64
36
11
56
32
57
51
30
21
2
62
23
34
63
73
61
33
50
55
54
35
41
43
44
42
90

FIG. 6

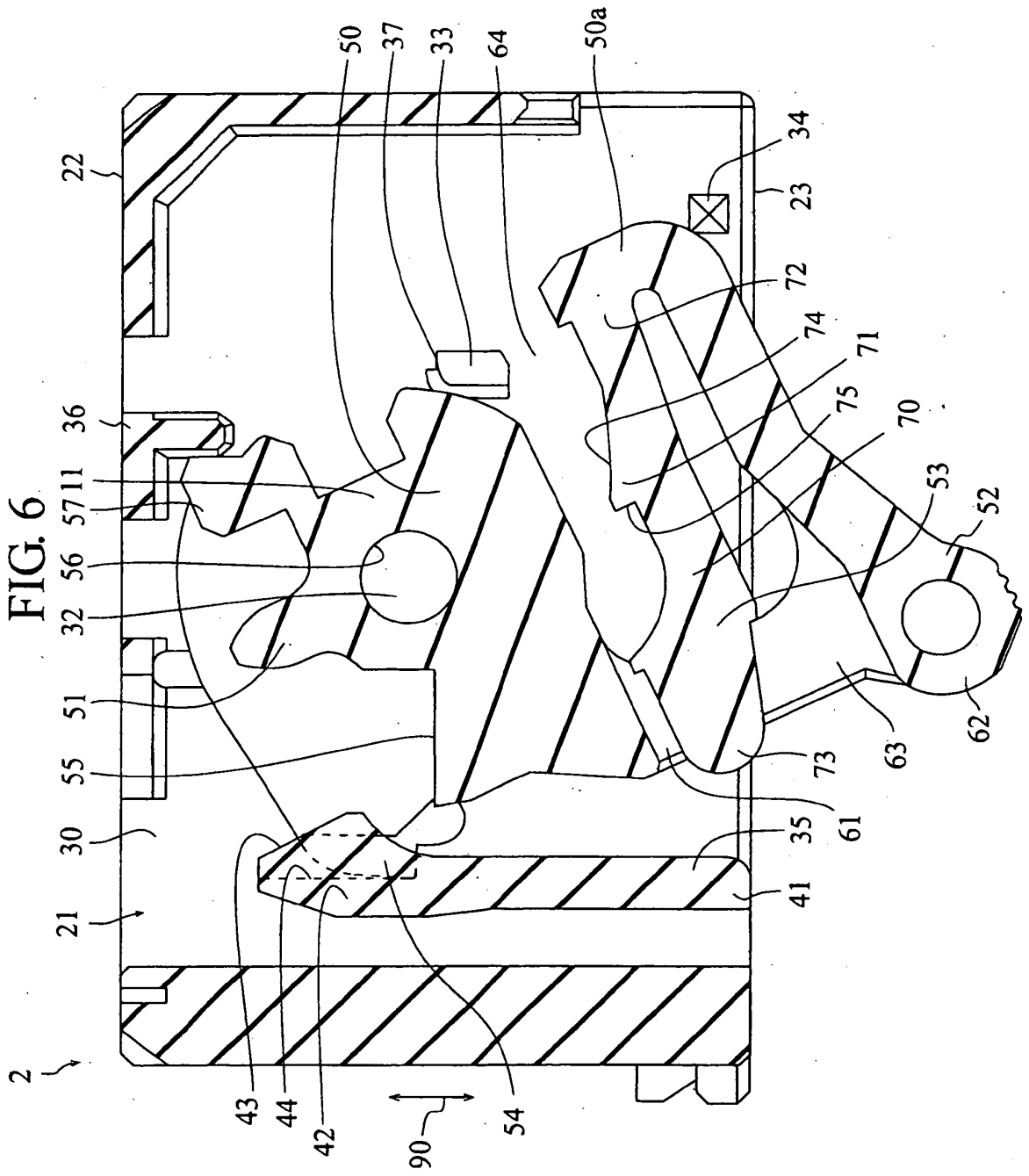

50
37
33
64
50a
34
22
23
72
74
71
75
70
36
11
57
56
32
53
52
51
55
30
73
63
62
61
35
21
41
2
43
44
42
90
54
L

FIG. 7

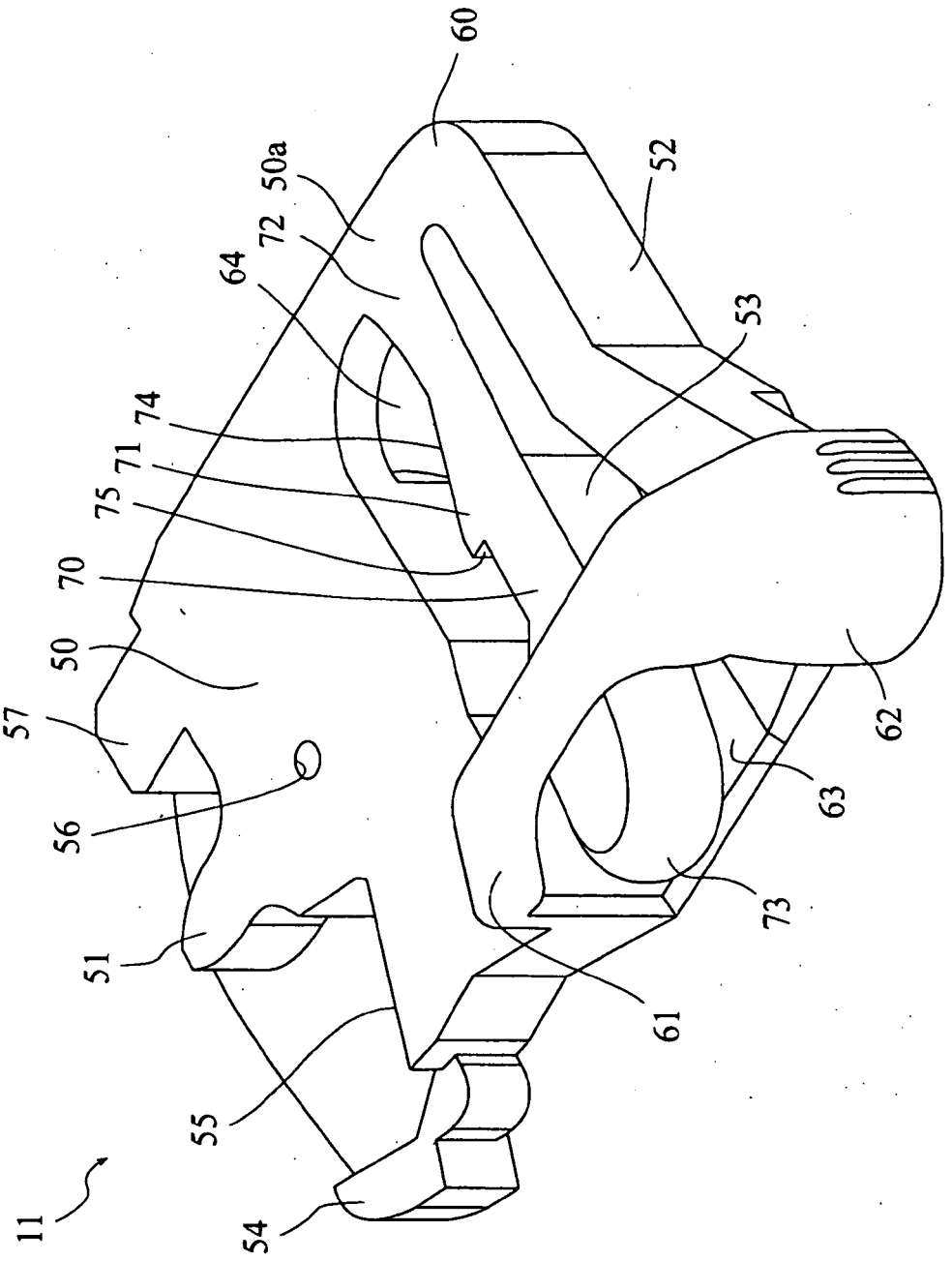


FIG. 8

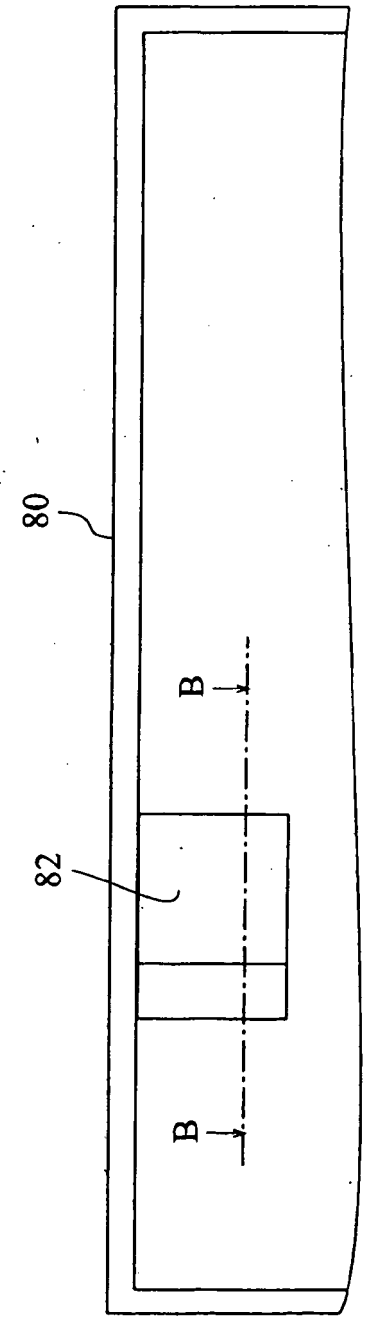


FIG. 9

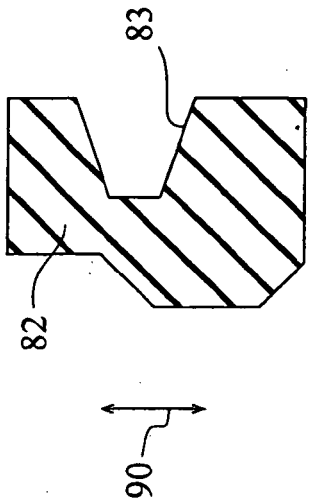


FIG. 10

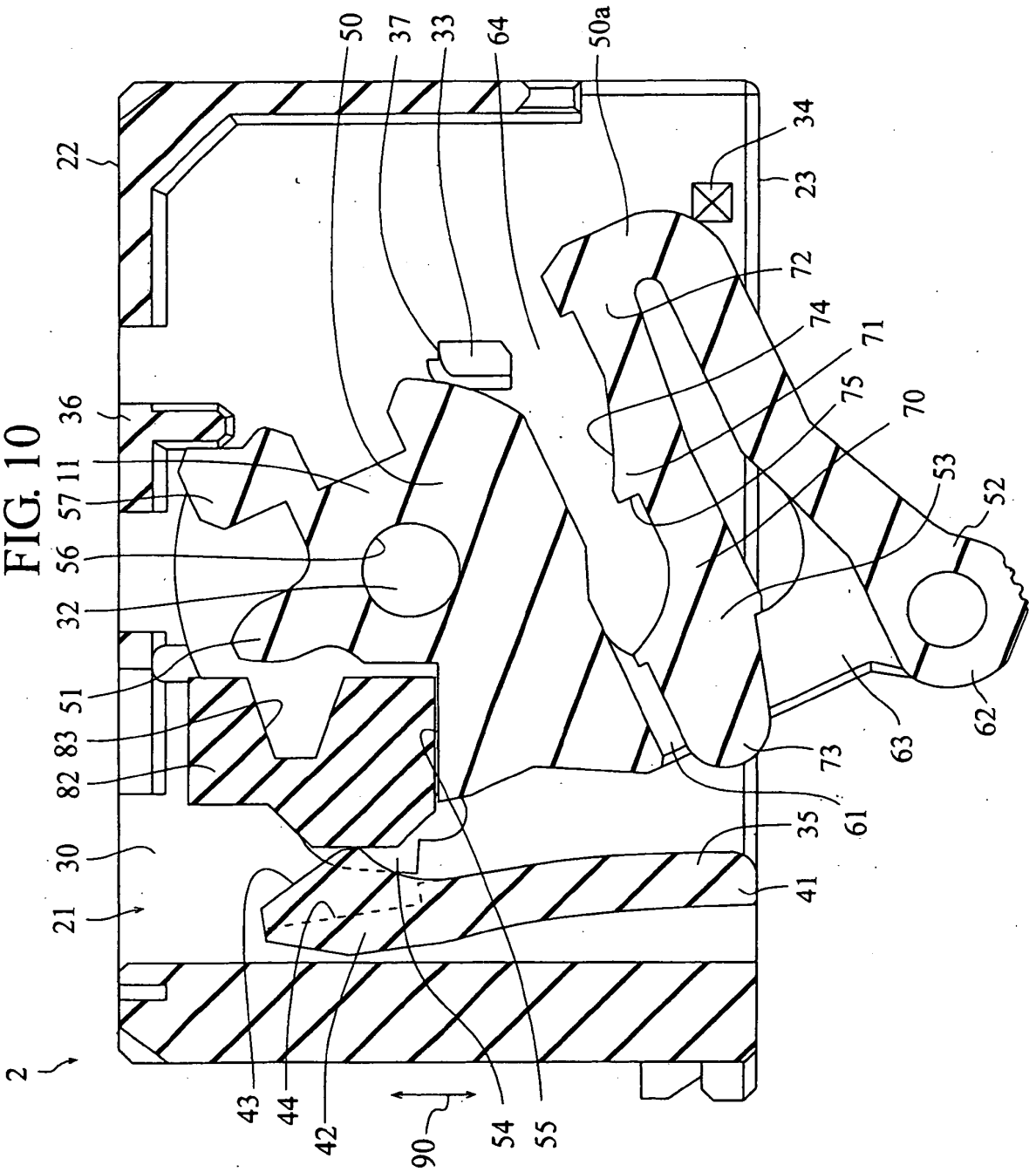

50
37
33
64
50a
22
34
23
72
74
71
75
70
53
52
36
11
57
56
32
51
83
82
30
21
2
73
63
62
61
35
41
43
44
42
90
54
55

FIG. 11

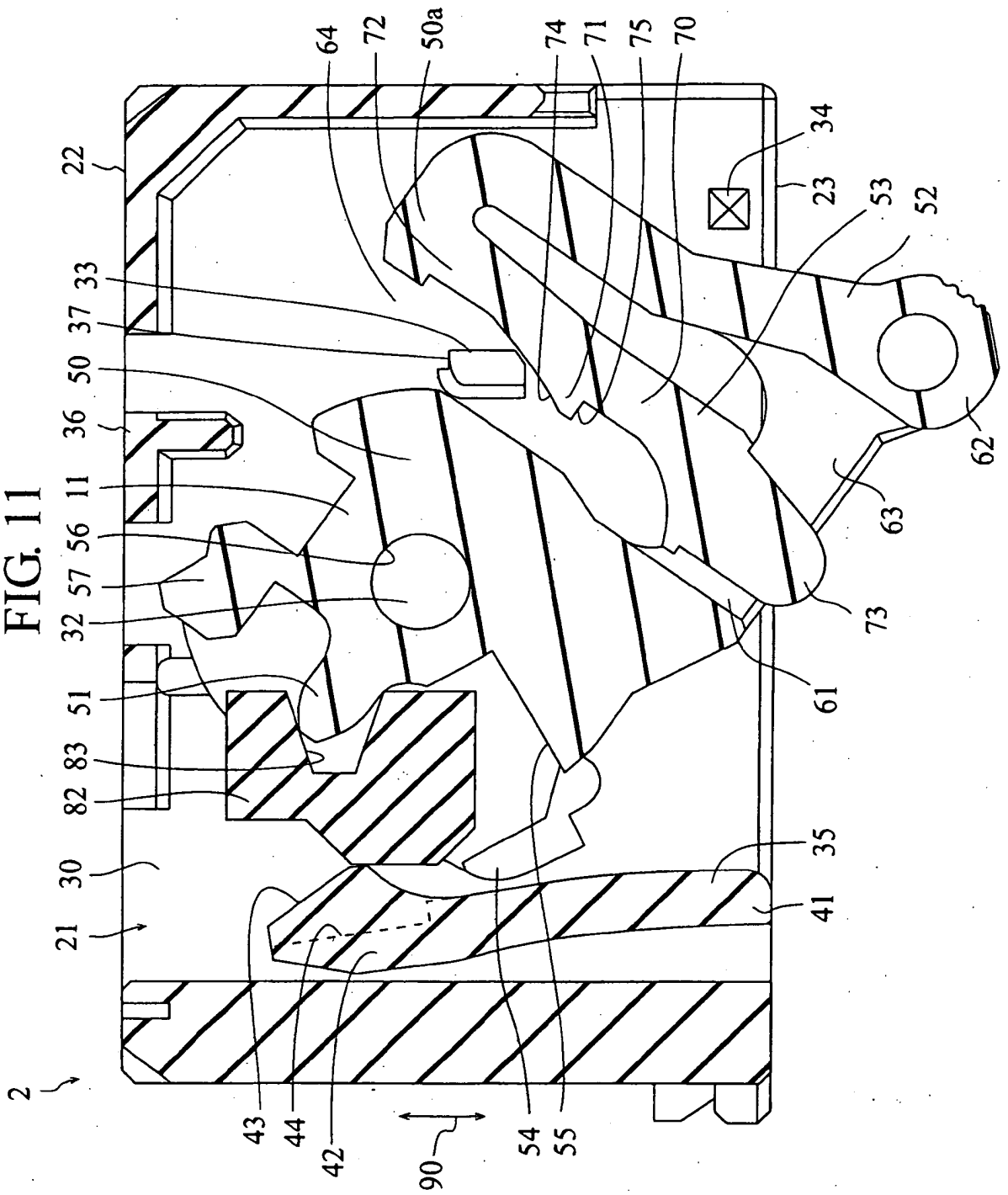

64
72
50a
74
71
75
70
34
22
23
53
52
33
37
50
36
11
56
57
32
51
83
82
30
21
2
62
63
73
61
35
41
43
44
42
90
54
55

FIG. 12

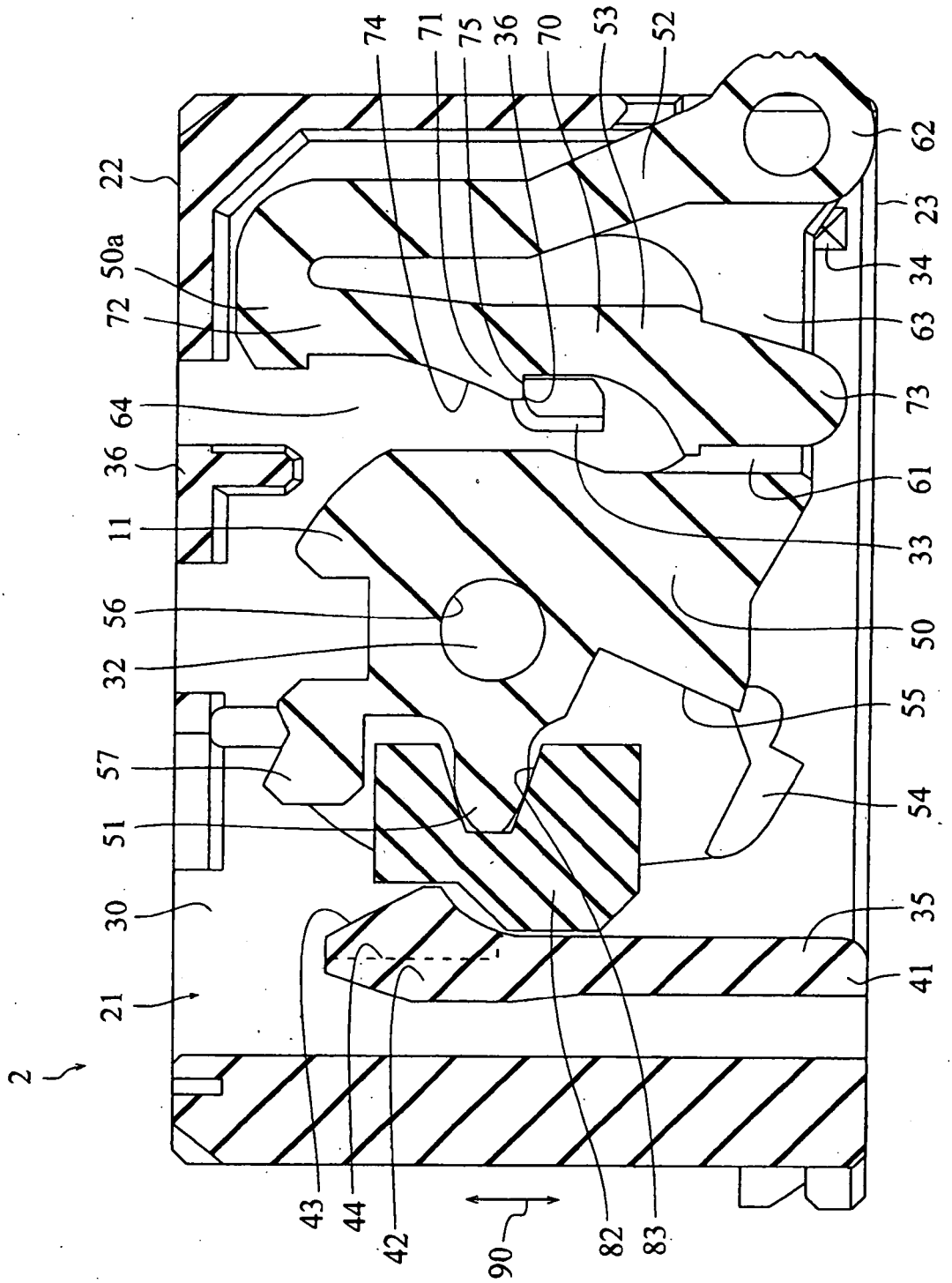

74
71
75
36
70
53
52
62
22
23
50a
34
72
63
64
73
36
61
11
33
56
50
32
55
57
54
51
35
30
41
21
2
43
44
42
90
82
83

FIG. 13

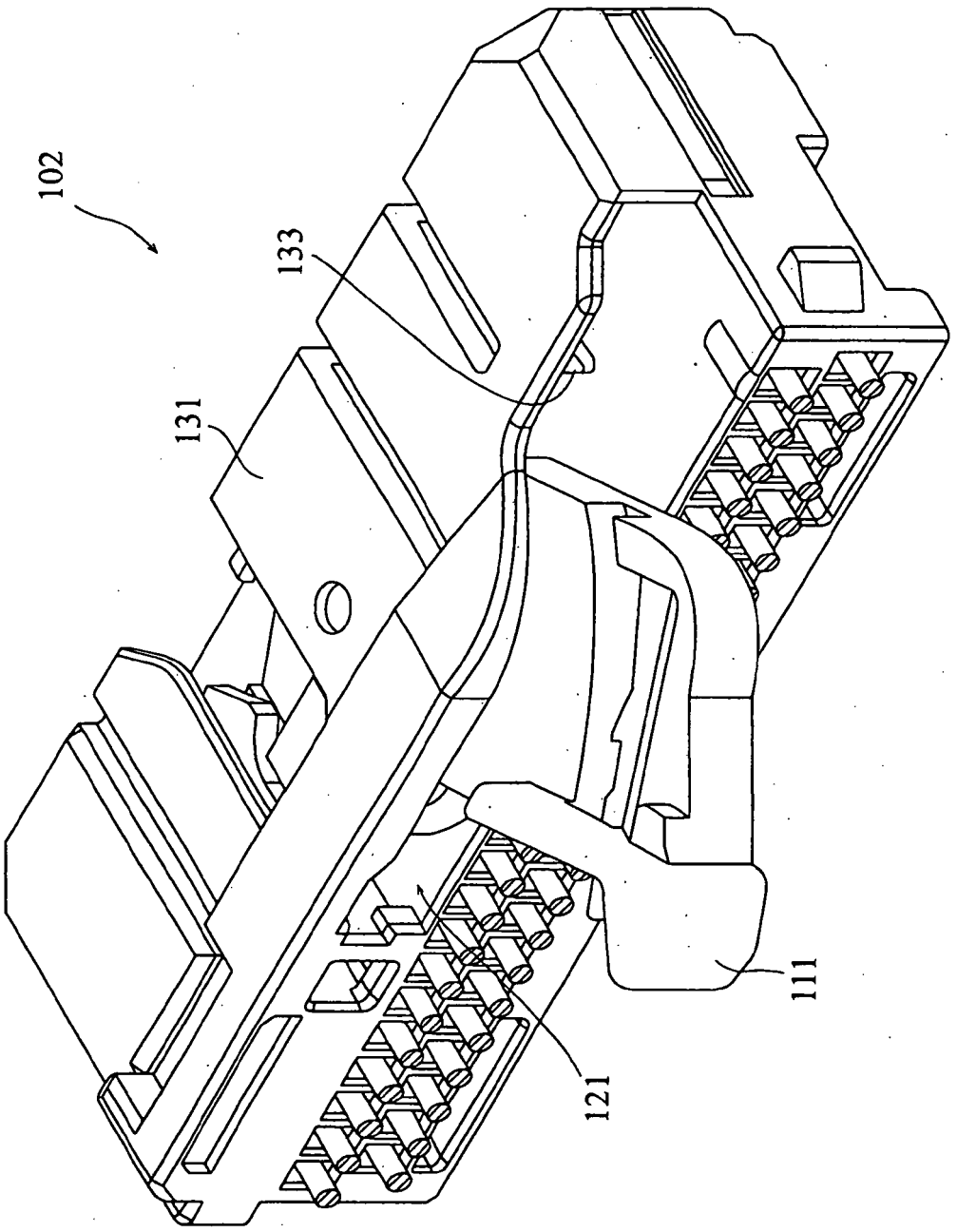


FIG. 14

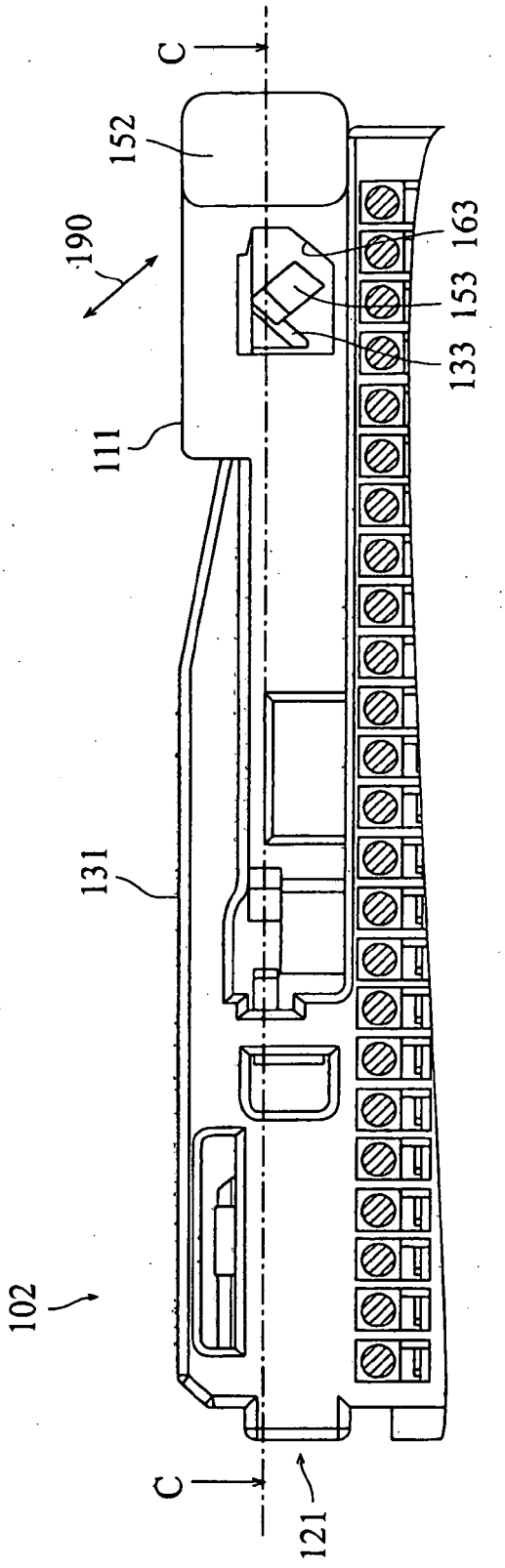


FIG. 15

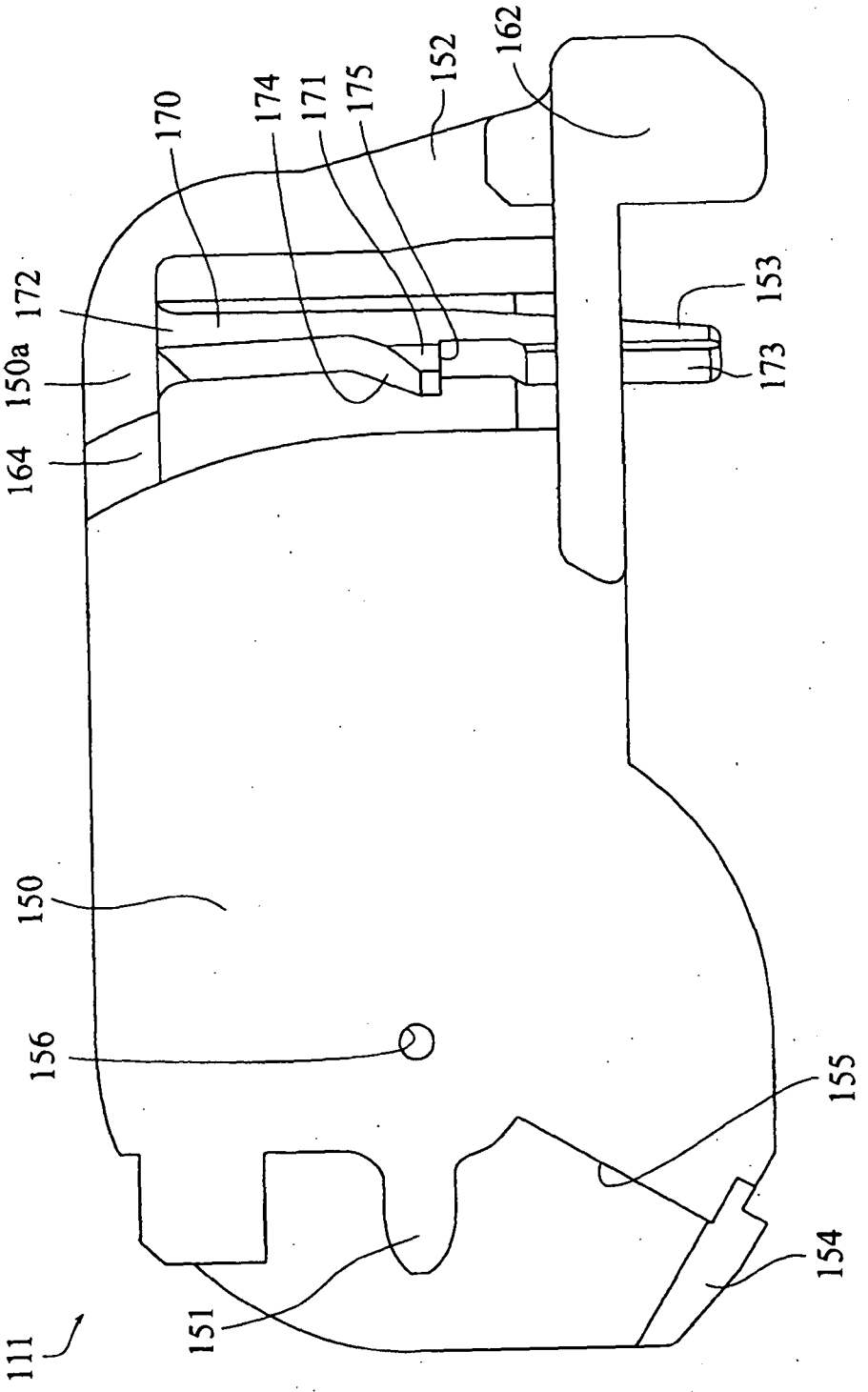
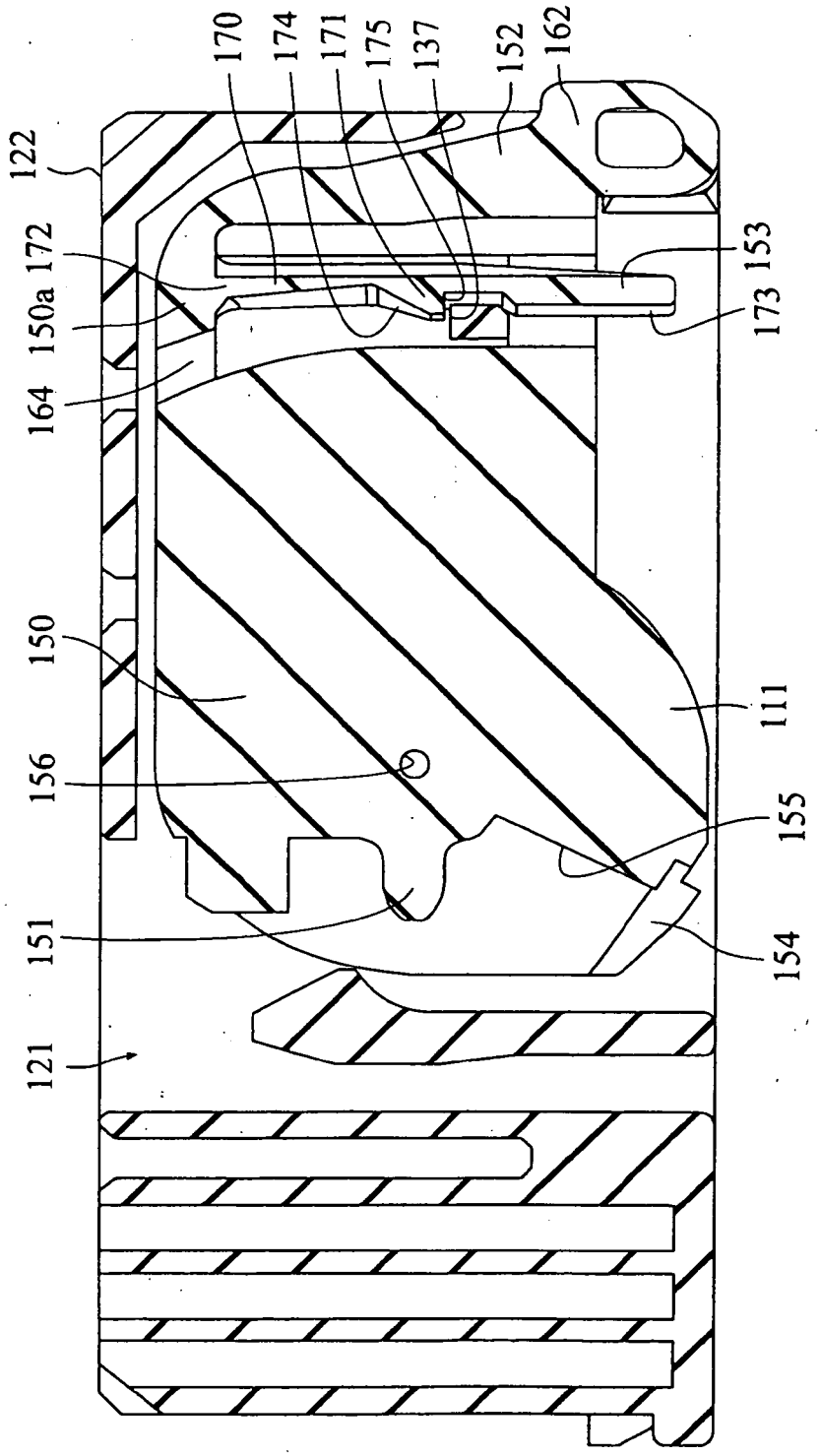

170
174
171
175
152
162
172
150a
164
153
173
150
156
155
154
151
111

FIG. 16


170
174
171
175
137
152
162
122
172
150a
164
153
173
150
111
156
155
151
154
121

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 6733313 B **[0002]**
- US 6733313 B2 **[0003]**
- JP 2006214011 A **[0052]**